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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/342,348	06/29/1999	TIMOTHY J. BROSNIHAN	07043/060002	6423

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EXAMINER

MAI, ANH D

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/342,348

Applicant(s)

BROSNIHAN ET AL.

Examiner

Anh D. Mai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 23-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 23-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 13-17 have been renumbered 23-27.

Status of the Claims

2. Amendment filed May 7, 2003 has been entered as Paper No. 18. Claims 23-27 have been added. Claims 1-12 and 23-27 are pending.

From Previous Office Action

3. The amendment filed August 28, 2002 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "the first trench electrically isolating elements of the microstructure from each other", as previously applied.

4. Claims 1-12 and 23-27 are rejected under 35 U.S.C. 112, first paragraph, for containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention, as previously applied.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-12 and 23-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bashir et al. (U.S. Patent No. 5,747,353) in view of Hunter et al. (U.S. Patent No. 4,631,803) all of record.

With respect to claim 1, as best understood by the examiner, Bashir teaches a method of fabricating a microelectromechanical system substantially as claimed including:

providing a substrate (102) having a device layer (106);

etching a first trench (121) in the device layer (106), the first trench surrounding a first region of the substrate;

forming a dielectric isolation layer in the first trench (121) to electrically isolate the first region from a second region of the substrate (106); and

etching a second trench (120) in the device layer (106), the second trench located in the first region and defining a microstructure (142/144), and the first isolation trench electrically isolating elements of the microstructure (first region) from each circuit region (second region).

(See Figs. 1-14, col. 3-col. 10).

Note that, the dielectric isolation layer of Bashir is formed by thermal oxidizing the exposed device layer (106) followed by depositing a polysilicon layer (similar to that of the present invention, page 12, line 27).

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Thus, Bashir is shown to teach all the features of the claim with the exception of depositing the dielectric isolation layer.

However, Hunter alternatively teaches forming a trench isolation including: depositing a dielectric isolation layer (40) in the trench (36) followed by depositing a filler layer (42) to electrically isolate the first region from the second region of the substrate. (See Fig. 2).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the isolation trench structure of Bashir by depositing a dielectric isolation layer (40) in the first trench (121) prior to filling the trench as taught by Hunter to eliminate the formation of defects in the surrounding semiconductor substrate.

With respect to claim 2, the method of Bashir further includes forming circuitry in a second region of the substrate outside the first region.

With respect to claim 3, Bashir teaches deposition of a metal layer, patterning of the metal layer to define the contacts. (See col. 5, ll. 39-50).

Thus, Bashir is shown to teach all the features of the claim with the exception of explicitly disclosing the connection of the microstructure to the circuitry.

However, Bashir clearly implies the formation of the metal layer is to connecting the microcircuit to the control circuit in the second region.

With respect to claim 4, the method of Bashir or Hunter further comprising depositing a filler material (poly or 42) over the isolation layer in the first trench (121 or 36).

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With respect to claim 5, wherein the isolation layer (40) of Hunter fills the first trench (36).

With respect to claim 6, wherein the substrate (100) of Bashir further includes a handle layer (102) and a sacrificial layer (104).

With respect to claim 7, wherein the method of Bashir further includes removing a portion of the sacrificial layer (104) to release the microstructure (142/144).

With respect to claims 8 and 9, wherein the step of etching the first (121) and second (120) trenches of Bashir etches through the device layer (106) to expose the sacrificial layer (104).

With respect to claim 10, wherein the sacrificial layer (104) of Bashir includes silicon dioxide.

With respect to claim 11, wherein the device layer (106) of Bashir includes epitaxial silicon.

With respect to claim 12, the isolation layer (40) of Hunter includes silicon nitride.

With respect to claim 23, the step of etching the second trench (120) of Bashir includes etching a portion of the device layer that abuts the first trench (121). (See Fig. 8).

With respect to claim 24, etching the second trench of Bashir includes laterally anchoring the elements (144) to the first isolation trench (filled) (121). (See Fig. 8).

With respect to claim 25, etching the second trench of Bashir includes forming at least one movable element (142) and at least one generally immobile element (144).

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6. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bashir '353 and Hunter '803 as applied to claim 1 above, and further in view of Peeters et al. (U.S. Patent No. 5,637,189).

Bashir teaches the first and second trenches are etched using an anisotropic RIE etch process.

Thus, Bashir is shown to teach all the features of the claim with the exception of explicitly using ICP.

However, Peeters teaches inductively coupled plasma (ICP) is one of many etching process known in the art to be reactive ions etch (RIE). (See col. 7, lines 3-20).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to etch the first and second trench of Bashir using ICP etcher as taught by Peeters because this dry etch process is well suited for construction of dimensionally accurate microdevices.

Response to Arguments

7. Applicant's arguments filed May 7, 2003 have been fully considered but they are not persuasive.

With respect to New Matter:

Applicants appear to contend that the limitation: "the first trench electrically isolating elements of the microstructure from each other" has support in the specification page 9, line 20-25.

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However, review the cited portion in the context of the disclosure, the term “isolation trench 18” is not the same as trench 60 (claimed: the first trench). The passage actually means: *in conjunction with the second trench*, the isolation trench 18 (which is filled) electrically isolates the microstructure elements in structure region from each other. For example, because they project from the different portions of the isolation trench, stationary electrodes 30a are electronically isolated from stationary electrodes 30b and from proof mass 24.

The underlined indicated the present of the second trench.

The claimed limitation, on the other hand recites: “the first trench (which is unfilled, empty and by itself) electrically isolating elements of the microstructure from each other”.

Applicants should go back to the formation of the trench 60, Fig. 6, page 12, lines 17-21: “trench 60 surrounds the portion of device layer 48 which will become structure region 14”. Clearly this first trench only isolates first region 12, circuit region, and second region 14, sensor region, from each other. Further, at this point in time, the elements of the sensor, have yet to be formed. Therefore, the matter is new and the disclosure does not have support for.

The rejection under 35 USC § 112, first paragraph, for new matter is therefore maintained.

With respect to Prior Art:

Applicants concludes: Bashir et al. does not disclose the claimed method. Rather than pointing out which limitations of claim 1 do not disclose by Bashir, Applicants recites in general terms, the process steps of Bashir. Note that, limitations of claim do not preclude these process steps.

One should ask whether or not Bashir etches a first trench, fills the first trench and etches a second trench so that in conjunction with the second trench, the filled first trench isolates elements of the microstructure from each other.

Yes, Bashir teaches all of the limitations as claimed. The first trench (121) have been etched surrounding the first region (sensor region). (See Fig. 2). The trench (121) has been filled by with a dielectric layer (oxide on the walls the opening) in the first trench (121) to electrically isolate the first region (sensor region) from a second region (circuit region). The second trench (120) located in the first region and defining the microstructure has been etched (See Fig. 7 and 8) and in conjunction with the second trench (120), the isolation trench (filled structure, not an empty trench) isolating elements (142, 144) of the microstructure from each other.

Applicant also states: "The resultant structure, as shown in Fig. 10 of Bashir, provides that elements 142 and 144 are actually one in the same elements. (The same unbroken polygon with the same shading.)" and concludes "Thus, these elements are electrically connected to each other".

Actually, Fig. 10 is the "masks" that Bashir uses for forming the microstructure.

One having ordinary skill in the art should have recognized that, the stationary electrodes (144) should be electrically isolated from the movable (suspended) electrodes (142) (see Fig. 9) because different electrodes of a capacitor pair in an accelerometer are not electrically connected.

In response to applicant's argument that *Hunter does not disclose using the isolation trench to electrically isolate elements of a microstructure from each other*, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of

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the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Hunter provides an alternative for filling the isolation trench. Note that, Hunter are not required to provide all elements of the claim, since this is an obvious rejection.

Conclusion

8. Applicant's amendment (newly added claims) necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M
August 15, 2003



LONG PHAM
PRIMARY EXAMINER